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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,670	06/24/2005	Chin Chang	US020636	2905

24737 7590 06/08/2009

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
P.O. BOX 3001
BRIARCLIFF MANOR, NY 10510

EXAMINER	
RAINEY, ROBERT R	
ART UNIT	PAPER NUMBER
2629	
MAIL DATE	DELIVERY MODE
06/08/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,670	CHANG, CHIN	
	Examiner	Art Unit	
	ROBERT R. RAINEY	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 February 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 March 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 2-19 have been considered but are moot in view of the new ground(s) of rejection.

Requirement for Information

2. Applicant and the assignee of this application are required under 37 CFR 1.105 to provide the following information that the examiner has determined is reasonably necessary to the examination of this application.

3. In response to this requirement, please provide answers to each of the following interrogatories eliciting factual information:

Interrogatory 1

The only place the specification mentions simultaneous solving of equations is at 8:23-25, “A modulation may be determined by simultaneously solving equations (2), (3), (4), or (5) with equation (1) where a coordinate pair (x.sub.w,y.sub.w) is pre-selected.”, which statement does not make sense to the examiner for several reasons, among them being (A) the fact that it appears that equation (1) was a model of the decay rate of the phosphor intensity with time that was used to derive equations (3), (4) and (5) and (B) the fact that equation (1) is not actually an equation, making it unclear as to how one would

simultaneously solve it. In response to this requirement please provide a step-by-step solution for each of the four equation pairs described in the quoted sentence and point out how the solution determines a modulation. That is examples of simultaneously solving each of the following:

- Equations (1) and (2)
- Equations (1) and (3)
- Equations (1) and (4)
- Equations (1) and (5)

In the alternative, applicant may state for any of the simultaneous solving examples that it is not capable of solution and provide explanation as to why it is not capable of solution and for the quoted statement as a whole provide explanation as to what is actually meant by the quoted statement.

Interrogatory 2

In looking at the equations, examiner is quite confused by the fact that equation (4) results in an I_y that is a unitless quantity, while equations (5) and (6) result in an I_y with units indicating light intensity. In response to this requirement please provide an explanation for the change of units between the equations and how this change affects equation (2) since in the mid and higher frequency cases a unitless I_b and an I_y with units indicating light intensity are used together.

Interrogatory 3

In response to this requirement please provide an explanation of what is meant by this statement from the specification, "In one embodiment, the processor control system 670 determines a modulation through a calculation of color coordinate pairs according to equation (1) based on various data such as PC-LED 520 output intensity." Equation (1) seems insufficient to calculate color coordinate pairs since it references no variables associated with color coordinates.

4. The applicant is reminded that the reply to this requirement must be made with candor and good faith under 37 CFR 1.56. Where the applicant does not have or cannot readily obtain an item of required information, a statement that the item is unknown or cannot be readily obtained may be accepted as a complete reply to the requirement for that item.

5. This requirement is an attachment of the enclosed Office action. A complete reply to the enclosed Office action must include a complete reply to this requirement. The time period for reply to this requirement coincides with the time period for reply to the enclosed Office action.

Note Regarding the Rejections

Two interpretations of the limitations added to the independent claims by the amendments submitted 2/25/2009 seem possible. The first interpretation is that the

newly add limitations produce claims that describe an embodiment comprised of the previously examined embodiment, represented by Fig. 7, combined with the embodiment disclosed at 8:19-25. This interpretation is used in the 35 U.S.C. 112, first paragraph, rejections below. The second interpretation is that the added limitations further describe the embodiment of Fig. 7. This interpretation is used for the 35 U.S.C. 103(a) below. Treatment of the newly added limitations is provided after the conclusion of the rejections of the independent claims as treated in the previous office action.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 2-19 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claims examined in the previous office action were directed to an invention in which the output of the PC-LED is sensed by a color sensor in order to provide an input for determining the modulation of the PC-LED drive signal during operation of the device as represented by Fig. 7. The newly submitted claims are directed to an invention, which combines the features of the embodiment of

Fig. 7 with an embodiment described at 8:19-25 in which the modulation is predetermined based on manufacturer data and a pre-selected CCT target as defined by a coordinate pair, which embodiment is described as an alternative to the embodiments of Fig. 5-7. Applicant disclosed no embodiment that combined these features nor teachings as to how they might be combined in the specification as filed.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 2-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,717,355 to *Takahashi et al*. ("*Takahashi*") in view of U.S. Patent No. 6,305,818 to *Lebens et al*. ("*Lebens*") and further in view of U.S. Patent No. 6,992,803 to *Chang* ("*Chang*")

As to **claim 2**, *Takahashi* discloses a method to provide color temperature correction in emission spectra of a phosphor converted LED (see for example column 3 line 56 to column 4 line 20 or Fig. 1 and column 8 line 66 to column 9 line 1 noting that "fluorescent material", i.e. item number 36, is an alternate

expression for "phosphor") under PWM current drive (see for example column 6 lines 31-32 “driven by a pulse current”), the method comprising:

sensing a correlated color temperature (CCT) of the LED emission spectra of the LED (see for example column 6 lines 20-32 noting that “the color tone of white light” is equivalent to CCT and that in order for the color tone of white light to be “adjusted delicately” it must be sensed);

determining a modulation for a driving current signal based on at least the sensed CCT (see for example column 6 lines 20-32 noting that in order for the color tone to be “adjusted delicately” by the “time sharing” the time sharing modulation must first be determined); modulating a constant magnitude current signal based on the determined modulation (see for example column 6 lines 20-32 noting that the modulation is based on time that “a pulse current” is applied); and applying the modulated current signal to cause a color temperature correction in the emission spectra of the LED (see for example column 6 lines 20-32 noting that adjusting the “color tone” is equivalent to “color temperature correction”).

Takahashi does not expressly disclose that determining a modulation includes determining a first emission spectra color coordinate set representing the LED emission spectra at a first operational temperature corresponding to a desired CCT, and determining a second color coordinate set representing a CCT shift in the LED emission spectra due to operation of the LED at a second

operational temperature corresponding to the sensed CCT, the color temperature correction corresponding to the CCT shift.

Lebens discloses a method and apparatus for LED illumination that includes a color detector and feedback circuit (see for example 13:40-48) to provide feedback to control the color of an LED including allowance for changes in LED spectrum according to LED temperature and in particular: determining a modulation (that is to say a signal change that affects the spectrum of the LED) which includes determining a first emission spectra color coordinate set representing the LED emission spectra at a first operational temperature corresponding to a desired spectrum (see for example 13:24-48; this is the desired spectrum or the one to which it "has its color spectrum controlled"; note for the combination that a CCT value is simply a way to reference a perceived spectrum for near white spectra), and determining a second color coordinate set representing a spectrum shift in the LED emission spectra due to operation of the LED at a second operational temperature corresponding to the sensed spectrum (see for example 13:24-48; this is the desired CCT or any variation from the one to which it "has its color spectrum controlled"), the color temperature correction corresponding to the spectrum shift (see for example 13:24-48; both an example of applying a shift appropriate to bring the spectrum back to a desired spectrum, i.e. "feedback reduces or eliminates color changes that would otherwise occur as temperature of the LED changed", and an example of a shift appropriate to achieve a new desired spectrum, i.e. "color changes are purposely induced" are

taught; note that it is not for the particular method of adjusting the output of the LED, in this case by changing the temperature of the LED, for which *Lebens* is cited but for the teaching that such an adjustment can be automated by including a sensor and feedback circuit).

Takahashi and *Lebens* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide single LED lights with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to improve the method of controlling LED lamp color using the time sharing color control means of *Takahashi* by adding a color detector and feedback circuit to provide control of the color control means to provide color temperature correction corresponding to the spectrum shift as taught by *Lebens*. The suggestion/motivation would have been to provide advantages such as to reduce or eliminate color changes that would otherwise occur as temperature of the LED changes (see for example *Lebens* 13:37-39).

The inclusion in the claims of elements drawn from the sentences found at 8:21-25 seem to add only elements that one of ordinary skill would obviously consider or techniques that one would obviously use in the determination of the modulation as follows.

"calculating needed parameters for the modulation" – since the combination cited performs the modulation it clearly calculates the needed parameters.

"based on manufacturer data, and based on a desired CCT under varying operational conditions including temperature, total light output, and phosphor composition" – this is merely a recitation of elements that one of ordinary skill in the art would obviously consider and would incorporate into the calculation in some manner. That this is such a recitation is particularly support by the fact that applicant offers no evidence of unexpected results or even an explanation as to how these elements are to be considered but only states that "criteria such as" these are used to determine the modulation.

"wherein the calculating includes simultaneously solving at least two equations" - As soon as the teaching is available that the difference between the rise and fall time emission characteristics of the LED and of the phosphor may be used to affect the color of the output of the device, the solution of at least two equations, one each for the phosphor and the LED, is clearly suggested to one of ordinary skill in the art. Since the described combination adjusts the color of the PC-LED it must solve the equations in some manner, whether by analog or digital processing or by lookup table (see Lebens Fig. 2 for an example of the use of a lookup table in the control circuit).

Takahashi and *Lebens* does not expressly disclose using a pre-selected coordinate pair for the desired CCT in the calculation. The tradeoffs between the use of a lookup table as in *Lebens* and the solution of equations whether by analog or digital processing were well known and one of ordinary skill in the art could have substituted one method for another with predicable results, which

makes the use of a processor to solve the required equations obvious. A desired color, however specified, is necessarily "pre-selected" since it is an input to the control function. If by "pre-selected" applicant means a factory setting that never changes, examiner would consider that merely a design choice.

Chang discloses a system to maintain the output of a combination of light sources at a desired value and in particular use of color coordinate pairs to define the colors of the lights individually and in combination in required calculations (see for example abstract and Eq. 3, which shows a three light version of Eq. 2 of the instant application).

Takahashi, *Lebens* and *Chang* are analogous art because they are from the same field of endeavor, which is LED lights, and further because they seek to solve the same problem, which is to provide LED lights with color control.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to implement the control required by the system of *Takahashi* and *Lebens* by specifying and processing the color data as color coordinate pairs as taught by *Chang* thus using a pre-selected coordinate pair for the desired CCT in the calculation. The suggestion/motivation would have been to provide advantages such as to use an industry standard method of specifying colors or to use a known alternative method that one of ordinary skill could have implemented with predictable results.

As to **claim 3**, the rejection of claim 2 over *Takahashi* and *Lebens* covered a combination of teachings that applying the determined modulation to the LED causes the LED emission spectra at the first color coordinate set to be substantially constant as the LED operational temperature changes from the first LED operational temperature to the second LED operational temperature (again see for example 13:24-48; especially "feedback reduces or eliminates color changes that would otherwise occur as temperature of the LED changed").

Claims 4-8, in addition to the rejection of claim 2 over *Takahashi* and *Lebens,* these claims represent techniques and relationships well known to those skilled in the art before the time of the invention; reference for example *Kamikawa* (see previous office action) and *Lebens*. Also well known was the mixing of multiple PWM sources to achieve a desired tone; reference for example *Takahashi* and *Lebens*. By way of explanation, consider that *Takahashi* teaches pulsed driving of the LED. The use of and relationships between output/intensity, pulse power, pulse width and frequency were well known. Once Takahashi taught changing the tone by time sharing of the LED and phosphor output, one of ordinary skill would then be led to quickly discover the relationships between tone, output/intensity, pulse power, pulse width and frequency when applied to the two linked sources, the LED and the phosphor. Also, selectively coupling a power supply to the LED is an inherent part of PWM.

As to **claim 9**, in addition to the rejection of claim 8 over *Takahashi* and *Lebens, Takahashi* further discloses that the LED is a phosphor converted white light LED (see for example column 6 line 29 "white light").

As to **claim 10**, in addition to the rejection of claim 9 over *Takahashi* and *Lebens*, operation of the combination such that the LED junction emission intensity is substantially constant while the phosphor emission intensity is increased responsive to the current signal modulation would have been fairly suggested to one of ordinary skill in the art at the time of the invention. Consider that the known techniques described in the rejection of claims 4-8 include the ability to change intensity by changing either pulse width or frequency. Combining this with the teachings of Takahashi to change the to by time sharing allows the tone to be changed by changing the ratio between the LED junction and phosphor light allows for the ratio of phosphor emission to LED junction emission to be changed while also adjusting the overall emissions in a manner that keeps the LED junction emission intensity substantially constant.

Claim 11 claims the structure implicit in the method claimed in claim 2 with the additional limitation that a color sensor is used to sense the CCT and is rejected on the same grounds and arguments as claim 2, since the rejection of claim 2 included a color sensor.

As to **claims 12 and 13**, in addition to the rejection of claim 11 over *Takahashi* and *Lebens*, these claims represent techniques and relationships well known to those skilled in the art before the time of the invention; reference for example *Kamikawa* (see previous office action) and *Lebens*. Also well known was the mixing of multiple PWM sources to achieve a desired tone; reference for example *Takahashi* and *Lebens*. By way of explanation, consider that *Takahashi* teaches pulsed driving of the LED. The use of and relationships between output/intensity, pulse power, pulse width and frequency were well known. Once Takahashi taught changing the tone by time sharing of the LED and phosphor output, one of ordinary skill would then be led to quickly discover the relationships between tone, output/intensity, pulse power, pulse width and frequency when applied to the two linked sources, the LED and the phosphor. Also, selectively coupling a power supply to the LED is an inherent part of PWM.

As to **claim 14**, in addition to the rejection of claim 11 over *Takahashi* and *Lebens*, the use of a processor as part of a color control circuit was well known to those skilled in the art at the time of the invention, reference for example *Kamikawa*.

As to **claim 15**, in addition to the rejection of claim 14 over *Takahashi* and *Lebens*, the use of the processor to control the functions already covered in claim 11 would have been obvious.

As to **claim 16**, the rejection of claim 15 over *Takahashi* and *Lebens* covered a combination of teachings that applying the determined modulation to the LED causes the LED emission spectra at the first color coordinate set to be substantially constant as the LED operational temperature changes from the first LED operational temperature to the second LED operational temperature (again see for example 13:24-48; especially "feedback reduces or eliminates color changes that would otherwise occur as temperature of the LED changed").

As to **claim 17**, in addition to the rejection of claim 11 over *Takahashi* and *Lebens, Takahashi* further discloses that the LED is a white light phosphor converted LED (see for example column 6 line 29 "white light").

As to **claim 18**, in addition to the rejection of claim 15 over *Takahashi* and *Lebens*, *Takahashi* further discloses that the LED is an InGaN phosphor converted white-light LED (see for example column 6 line 29 "white light" and column 4 line 13 "Ga...In...N").

Claim 19 claims the structure covered in the rejection of claim 11 and is rejected on the same grounds and arguments.

Conclusion

3. This Office action has an attached requirement for information under 37 CFR 1.105. A complete reply to this Office action must include a complete reply to the attached requirement for information. The time period for reply to the attached requirement coincides with the time period for reply to this Office action.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT R. RAINEY whose telephone number is (571)270-3313. The examiner can normally be reached on Monday through Friday 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amare Mengistu can be reached on (571) 272-7674. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RR/

/Amare Mengistu/
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